CBSE Test Paper-01

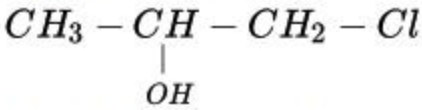
Class - 12 Chemistry (Haloalkanes and Haloarenes)

1. What is inversion of configuration?
   a. secondary butyl chloride
   b. w-butyl bromide
   c. tert-butyl chloride
   d. iso-butyl iodide
2. Bromomethane, Chloromethane, Dibromomethane. 1 – Chloropropane, Isopropyl chloride, 1 – Chlorobutaneare all
   a. Completely soluble in organic solvents
   b. Slightly soluble in organic solvents
   c. Insoluble in organic solvents
   d. Completely soluble in water
3. Triiodomethane (Iodoform) is
   a. Pesticide
   b. Refrigerant
   c. antiseptic drug
   d. degreasing agent
4. Reactions with iodine in preparation of aryl iodide from arenes require the presence of
   a. diazonium salt
   b. an oxidizing agent
   c. a reducing agent
   d. $ZnCl_2$ catalyst
5. Anisole reacts with a mixture of concentrated sulphuric and nitric acids to yield a mixture of ortho and paranitroanisole

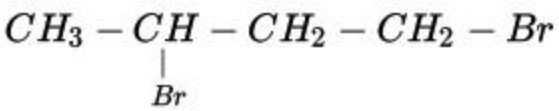
   a. None of these

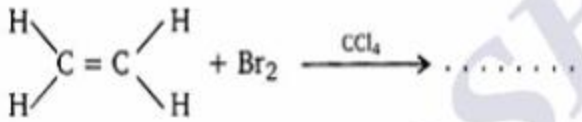
b. minor product is orthonitroanisole
c. major product is paranitroanisole
d. ortho and para in equal amounts.

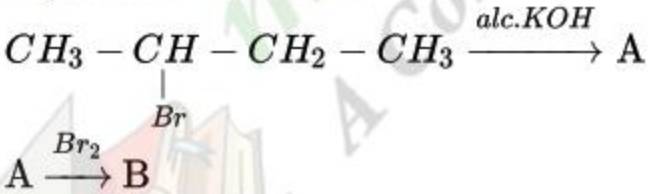
6. What is meant by axis of symmetry?
7. Give IUPAC names of:



8. Give IUPAC name of:



9. Give the structure of 1,3-dichloro -2-(bromomethyl) propane
10. Complete the following reaction equation:
    i. $C_6H_5N_2^+Cl^+ + KI \rightarrow$ .....
    ii. 
11. Write the structure of the major organic product in the following reaction:
    $CH_3CH_2CH_2OH + SOCl_2 \rightarrow$
12. A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single monochloro compound C_5H_9Cl in bright sunlight. Identify the hydrocarbon.
13. Write the structural formula of the organic compounds A and B in the following sequence of reaction.



14. Point out the difference between:
    i. Chirality and chiral centre.
    ii. Diastereoisomers and Enantiomers.
15. Explain why
    i. the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?
    ii. alkyl halides, though polar, are immiscible with water?
    iii. Grignard reagents should be prepared under anhydrous conditions?

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Solutions

1. (a) secondary butyl chloride

   Explanation: Secondary butyl chloride is optically active because it has chiral carbon atom marked*

   $$CH_3 - \underset{\underset{Cl}{|}}{\overset{*}{C}}H - CH_2^- - CH_3$$

2. (a) Completely soluble in organic solvents

   Explanation: These all are covalent compounds hence are soluble in organic solvents.

3. (c) antiseptic drug

   Explanation: The compound finds small scale use as a disinfectant.Around the beginning of the 20th century it was used in medicine as a healing and antiseptic dressing for wounds and sores, although this use is now superseded by superior anticeptics.

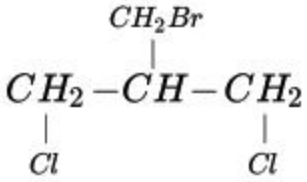
4. (b) an oxidizing agent

   Explanation: Reactions with iodine are reversible in nature and require the presence of an oxidising agent (HNO_3, HIO_4) to oxidise the HI formed during iodination.

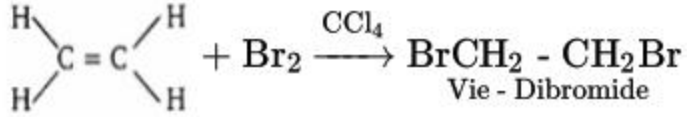
5. (c) major product is paranitroanisole

   Explanation: OCH_3 is activator and o/p director out of which para is major product.

6. It is an imaginary axis around which if the compound is rotated by a minimum angle of rotation, it gives back the original molecule with same configuration.
7. 1-Chloropropan-2-ol
8. In writing the IUPAC name, we first count the number of C atoms in the longest C chain (parent chain) and assign the locants according to the functional groups attached. Here as we can see the longest chain contains 4 C and it is an alkane, so we name it butane. The -Br (bromo) group is attached at position 1 and 3. So the name of the compound is 1,3-dibromobutane.
9. We can understand from the name that the longest C chain contains 3 C (as it is propane). Also at positions 1 and 3, -Cl is attached and at position 2, bromomethyl group i.e. $-CH_2Br$ is attached. So the structure of the given compound must be:



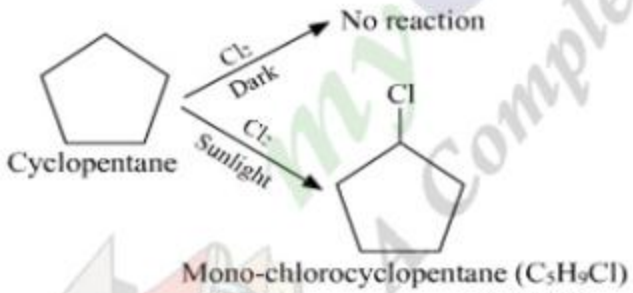
10. i. $C_6H_5N_2^+Cl^- + KI \rightarrow C_6H_5I + KCl + N_2$

ii. 

11. $CH_3CH_2CH_2OH + SOCl_2 \rightarrow CH_3CH_2CH_2Cl + SO_2 + HCl$
(1–Propanol; 1–Chloropropane)

12. A hydrocarbon with the molecular formula, C_5H_{10} belongs to the group with a general molecular formula C_nH_{2n}.Therefore, it may either be an alkene or a cycloalkane. Since hydrocarbon does not react with chlorine in the dark, it cannot be an alkene. Thus, it should be a cycloalkane. Further, the hydrocarbon gives a single monochloro compound, C_5H_9Cl by reacting with chlorine in bright sunlight. Since a single monochloro compound is formed, the hydrocarbon must contain H-atoms that are all equivalent. Also, as all H-atoms of a cycloalkane are equivalent, the hydrocarbon must be a cycloalkane. Hence, the said compound is cyclopentane.

Cyclopentane (C_5H_{10}) The reactions involved in the question are:



13. $CH_3 - CH(Br) - CH_2 - CH_3 \xrightarrow{alc.KOH} CH_3\text{-}CH{=}CH\text{-}CH_3$

$\xrightarrow{Br_2} CH_3 - CH(Br) - CH(Br) - CH_3$

Thus A is but-2-ene and B is 2,3-dibromobutane

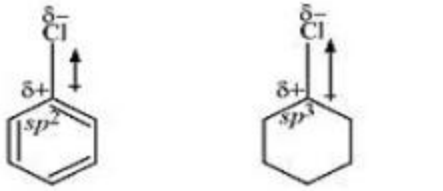
14. i. **Chirality**: Chirality is the property of a molecule, containing a carbon attached to four different groups, having a non-superimposable mirror image.

Chiral centre: The carbon which is attached to four different groups is called chiral centre.

ii. **Diastereoisomers:** Those pairs of stereoisomers which are not mirror images of each other. They differ in optical rotation.

Enantiomers: They are non-superimposable mirror images of each other. They have optical rotation equal in magnitude but opposite in sign.

15. i.



Chlorobenzene Cyclohexyl chloride

In chlorobenzene, the Cl-atom is linked to a sp^2 hybridized carbon atom. In cyclohexyl chloride, the Cl-atom is linked to a sp^3 hybridized carbon atom. Now, sp^2 hybridized carbon has more s-character than sp^3 hybridized carbon atom. Therefore, the former is more electronegative than the latter. Therefore, the density of electrons of C - Cl bond near the Cl-atom is less in chlorobenzene than in cyclohexyl chloride. Moreover, the - R effect of the benzene ring of chlorobenzene decreases the electron density of the C - Cl bond near the Cl-atom. As a result, the polarity of the C - Cl bond in chlorobenzene decreases. Hence, the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

ii. To be miscible with water, the solute-water force of attraction must be stronger than the solute-solute and water-water forces of attraction. Alkyl halides are polar molecules and so held together by dipole-dipole interactions. Similarly, strong H-bonds exist between the water molecules. The new force of attraction between the alkyl halides and water molecules is weaker than the alkyl halide-alkyl halide and water-water forces of attraction. Hence, alkyl halides (though polar) are immiscible with water.

iii. Grignard reagents are very reactive. In the presence of moisture, they react to give alkanes.

$$\underset{Grigrard\ reagent}{\overset{\delta-\ \delta+\ \delta-}{R\,M\,gX}} + H_2O \rightarrow \underset{Alkane}{R-H} + Mg(OH)X$$

Therefore, Grignard reagents should be prepared under anhydrous conditions.